Ontario

Ministry of the Environment

Northeastern Region

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Ministry of the Environment 1978

Environmental Control Program

Inco Limited, Sudbury

Background and Perspective

Northeastern Region
July 31, 1978

Inco Limited

During the 1960's the International Nickel Company of Canada Limited (currently known as Inco Metals Company, a unit of Inco Limited, in the Regional Municipality of Sudbury) operated several facilities which emitted sulphur dioxide into the atmosphere. These included the Copper Cliff Smelter complex located west of the City of Sudbury in the Town of Copper Cliff, the Iron Ore Recovery Plant including the associated C.I.L. Acid Plants located south of Highway 17 west in Walden Township, and the Coniston operation located east of Sudbury in the Town of Coniston. The Coniston operation was shut down by the Company in 1972 and a new Nickel Refinery was added adjacent to the Iron Ore Recovery Plant in 1973. The location of these facilities relative to the City of Sudbury is shown on the attached map.

Environmental Control Program

On July 13, 1970, a Control Order was issued to the International Nickel Company of Canada Limited which provided for the erection of a new chimney to a height of 381 metres (1250 feet) to replace three existing chimneys at the Copper Cliff Smelter complex. In addition, the Order provided for the progressive reduction of sulphur dioxide (SO_2) emissions from all Company sources. This original Control Order and its Amendments dealt solely with SO_2 emissions and was based 1) on technically feasible means of SO_2 control considered practicable at that time, 2) on a need to restrict tonnage emissions due to the unpredictability of dispersion under all weather conditions, and 3) on potential adverse effects on vegetation, soil and water in a large area surrounding Sudbury. The total SO_2 emissions from the various Company operations in the Sudbury area, as surveyed in 1969 prior to the issuance of the 1970 Control Order, were 6262 tons/day. The current permitted SO_2 emission rate from all Inco sources in the Sudbury area is 3850 tons/day (3600 tons/day from the Copper Cliff Smelter and 250 tons/day from the Iron Ore Recovery Plant and Nickel Refinery). This represents an overall reduction in SO_2 emissions to the atmosphere since 1969 of 2412 tons/day or 38.5%.

To assess the impact of these abatement measures as a result of the 1970 Order, the Ministry expanded its air quality monitoring network, continued its vegetation surveillance programme, and implemented an extensive Sudbury Environmental Study.

Air Quality

Attached is a summary of the past ten years air quality data for the Sudbury Area (Figure 2; Table 1). The data presented show that the ground level concentrations of SO_2 in the Sudbury area decreased appreciably since the start up of the 1250 foot chimney in 1972. The percentage of total hourly readings of SO_2 greater than the Provincial

Criterion of 0.25 ppm for the nine stations decreased from 1.33% for the period 1967-1971 to 0.39% for the period 1973-1977. This is a reduction of 71% and indicates that 99.61% of the time SO_2 hourly average concentrations were below the Provincial Criterion at these nine stations. Further details on the total air monitoring network in the greater Sudbury area may be found in the recent publication "Air Quality Assessment Studies in the Sudbury Area, Volume I - Ambient Air Quality 1976-1977".

Vegetation Studies

As a result of improved air quality since 1972, the following effects on vegetation in the Sudbury area have been noted: a) a significant reduction of 77% in the number of potentially injurious fumigations for the period 1973-1977 as compared to the period 1967-1971; b) a decreased mortality and increased growth rate of sensitive species such as white pine; c) an increased activity and success in the revegetation of barren areas and the establishment of an agricultural greenbelt as part of the Regional Municipality of Sudbury Official Plan.

While historic emissions caused significant and widespread vegetation and soil damage in the Sudbury area, there is no doubt that emission reduction steps taken by the local industries since 1972 have resulted in substantial vegetation recovery. More specific information may be found in the recent publication, "Air Quality Assessment Studies in the Sudbury Area, Volume II - Effects of Sulphur Dioxide and Heavy Metals on Vegetation and Soils 1970-1977".

Sudbury Environmental Study

The Sudbury Environmental Study has as its objective the development of criteria and associated rationale, supported by scientifically justifiable information, for the management of the air emissions from the mining and smelting industries located in the Sudbury area. This study, which reached its full operating level in fiscal 1974/75, and is to be completed by December 1980 has, to date, revealed the following:

(i) Stack sampling of Inco's 1250 foot chimney since 1973 has confirmed the required SO_2 reductions as well as a 55% reduction in particulate emissions.

(ii) Based on the 1976 SO_2 emission data from the Sudbury area, it is estimated that the SO_2 emissions from Sudbury accounted for only 3.8 to 4.0% of North American anthropogenic (man-made) emissions. This corresponds to 1.1 to 1.3% of global anthropogenic emissions.

(iii) The contribution of Sudbury emissions to the pH of precipitation in Ontario is at present indistinguishable from that originating from other areas.

(iv) Long-range transport of sulphates to the Sudbury area by air masses originating outside the region is significant.

This is a large-scale problem affecting the whole of Ontario and the effects are manifested in the precipitation chemistry and ambient air concentrations.

(v) First estimates of dry gaseous deposition indicate that roughly 5% of the Sudbury SO_2 emissions are deposited within 125 km.

1978 Control Order

On the basis of an assessment of the considerable data and information collected since 1970, the Ministry of the Environment has concluded that the problems of high ground level concentrations of SO_2 and widespread acute vegetation damage in the Sudbury area have essentially been resolved, even at current emission rates. The success in resolving these problems is due in large part to Inco's Voluntary Emission Reduction Program (VERP) in which significant emission reductions are made during days when poor dispersion conditions are predicted. The resolution of these problems has been accomplished without any measurable effect on vegetation or SO_2 levels in areas remote from Sudbury. At the same time however, the Ministry recognized the importance of the worldwide phenomenon of acid precipitation. Unfortunately this is a very complex problem involving long-range transport of oxides of nitrogen as well as oxides of sulphur.

As a result of this, the Director, Northeastern Region has today issued three documents to Inco Limited. These are a Control Order, a Requirement and Direction, and a Provincial Officer Requirement. It should be noted that these Orders cover not only SO_2 emissions but in fact deal with all environmental concerns of Inco's Sudbury operations.

- TABLE 1 -

PERCENTAGE FREQUENCY OF EXCEEDANCE OF THE
SO_2 PROVINCIAL CRITERION (1HR) IN THE SUDBURY AREA
FOR THE PERIODS 1967 TO 1971 AND 1973 TO 1977

STATION	PERCENTAGE OF TOTAL HOURLY READINGS GREATER THAN THE PROVINCIAL CRITERION OF 0.25 ppm	
	1967-1971	1973-1977
GARSON	2.81	0.68
CALLUM	1.06	0.27
RAYSIDE	1.51	0.27
SKEAD	4.84	1.56
LAKE PENAGE	0.65	0.14
ST. CHARLES	0.05	0.04
BURWASH	0.27	0.29
MORGAN	0.33	0.11
GRASSY LAKE	0.15	0.04
ENTIRE NETWORK	1.33	0.39

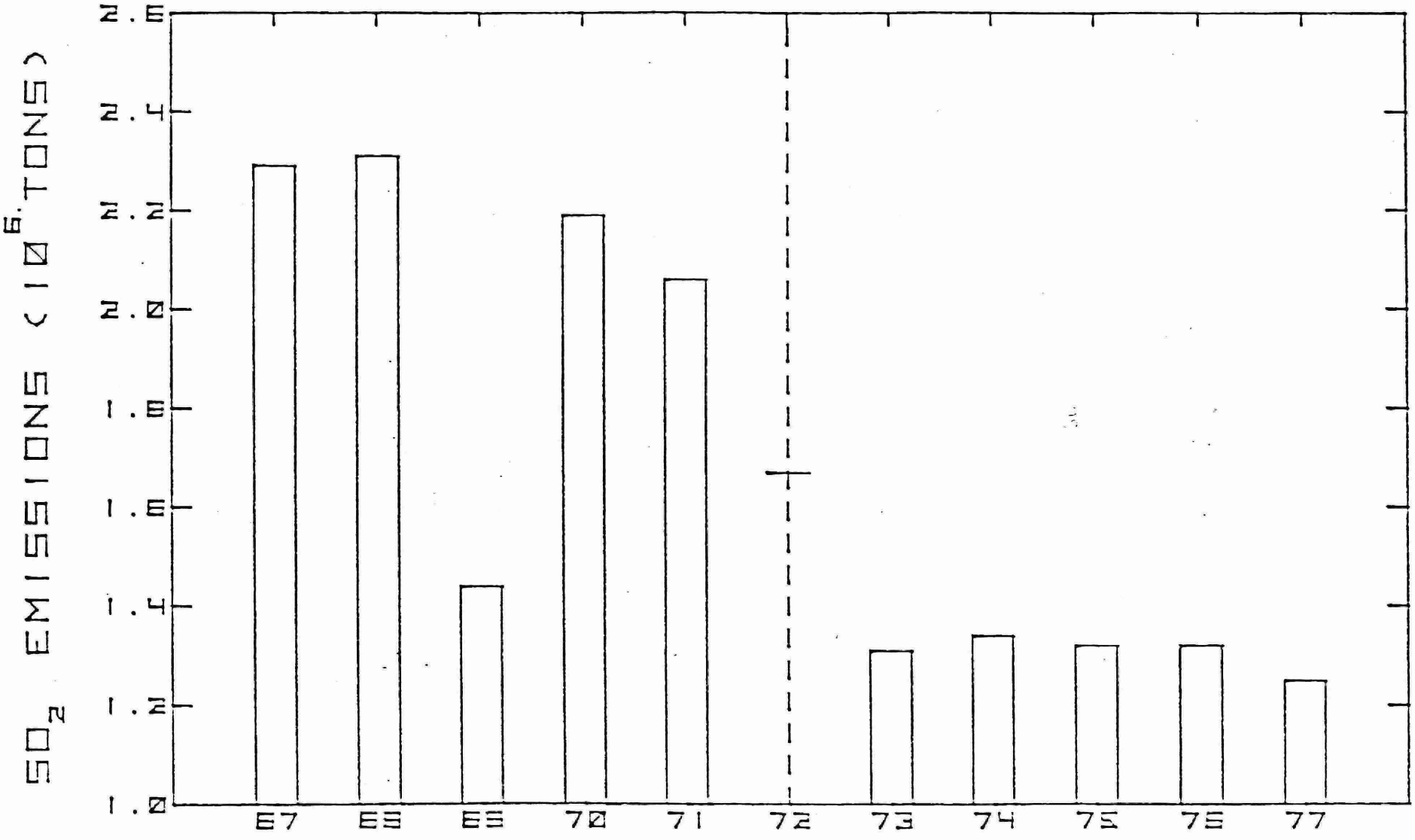


FIG. 1 ANNUAL SO_2 EMISSIONS FROM INCO OPERATIONS

(VALUES RELEASED BY THE INCO METALS CO.)

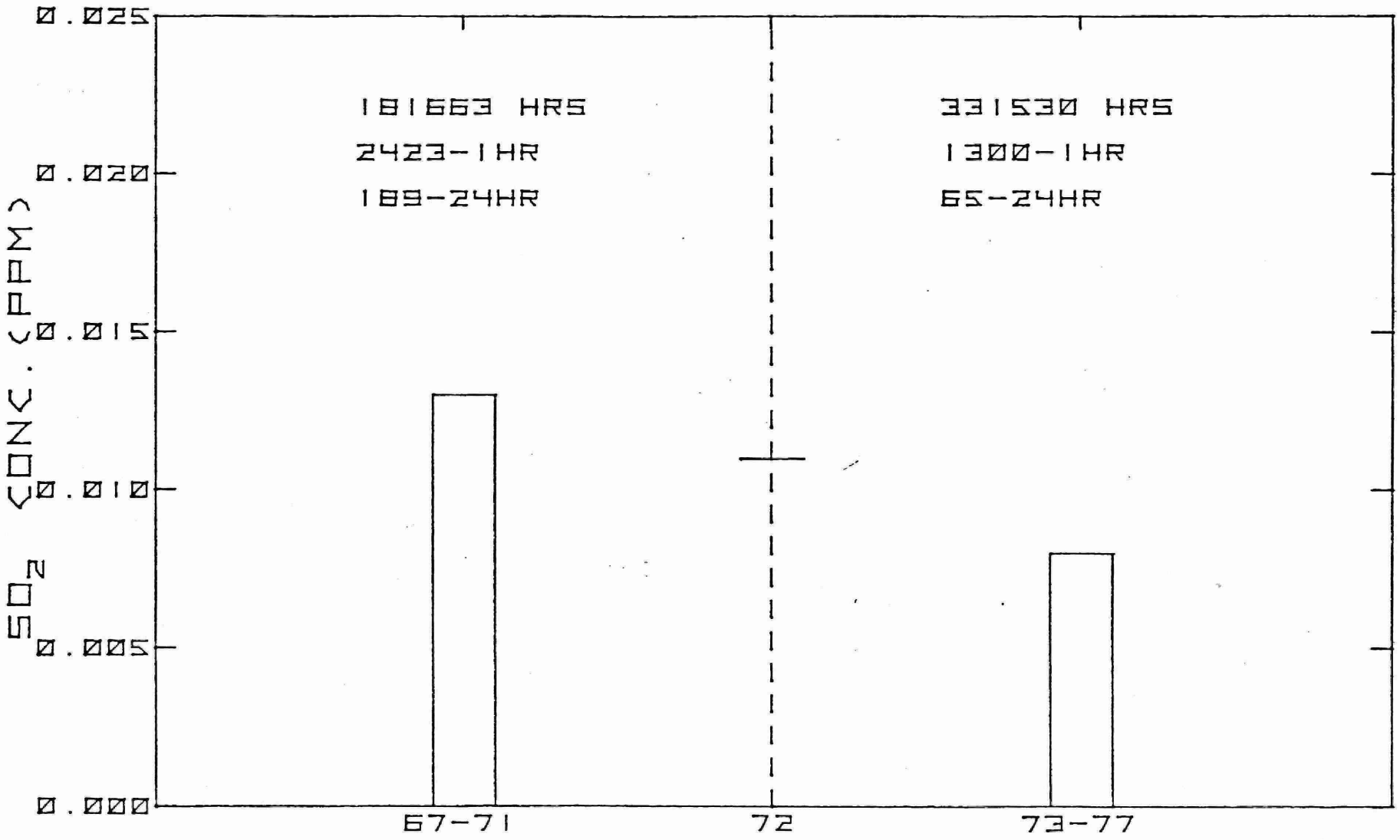


FIG. 2 MEAN SO_2 CONC. IN THE SUDBURY AREA FOR 1967-71 AND 1973-77

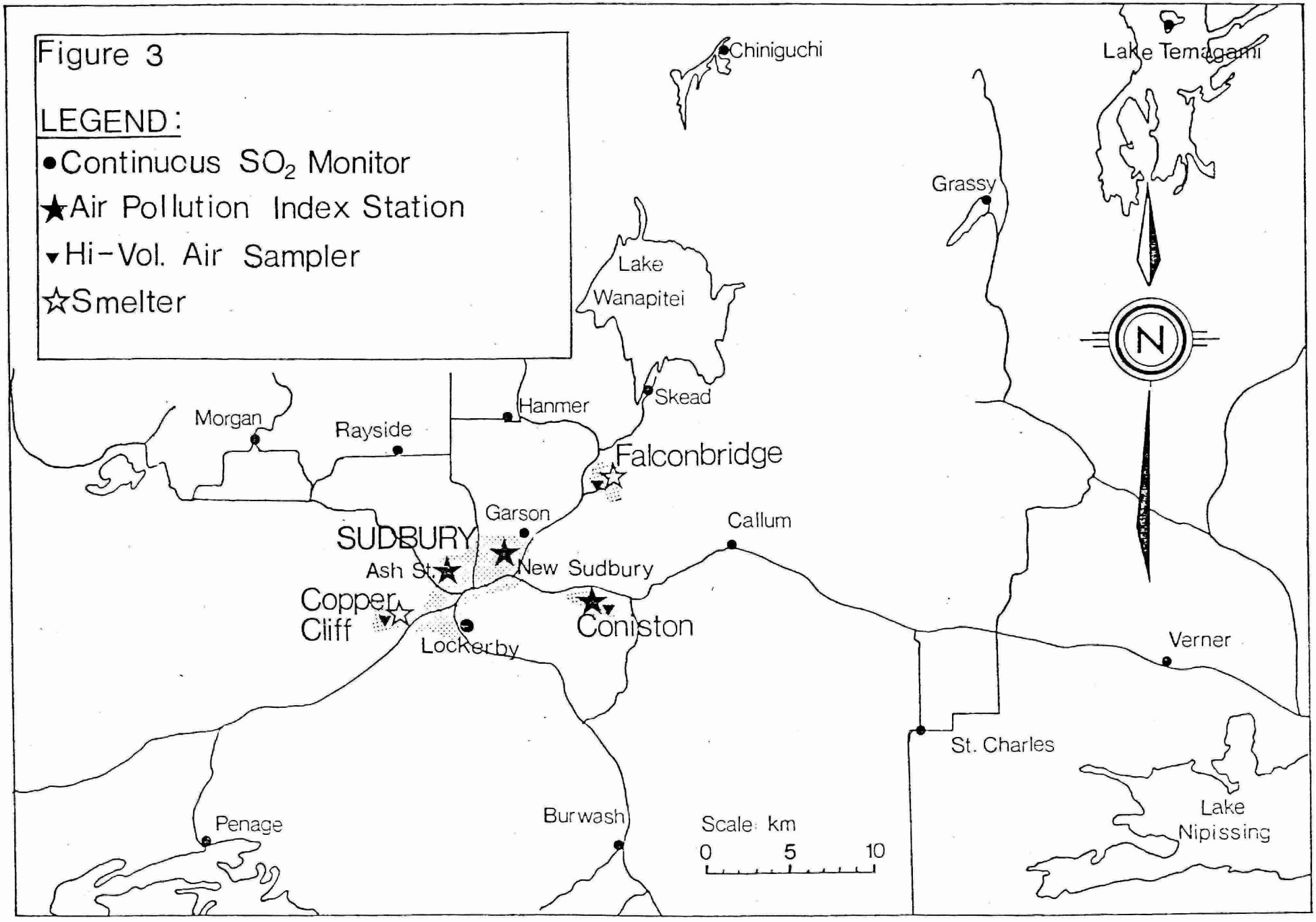
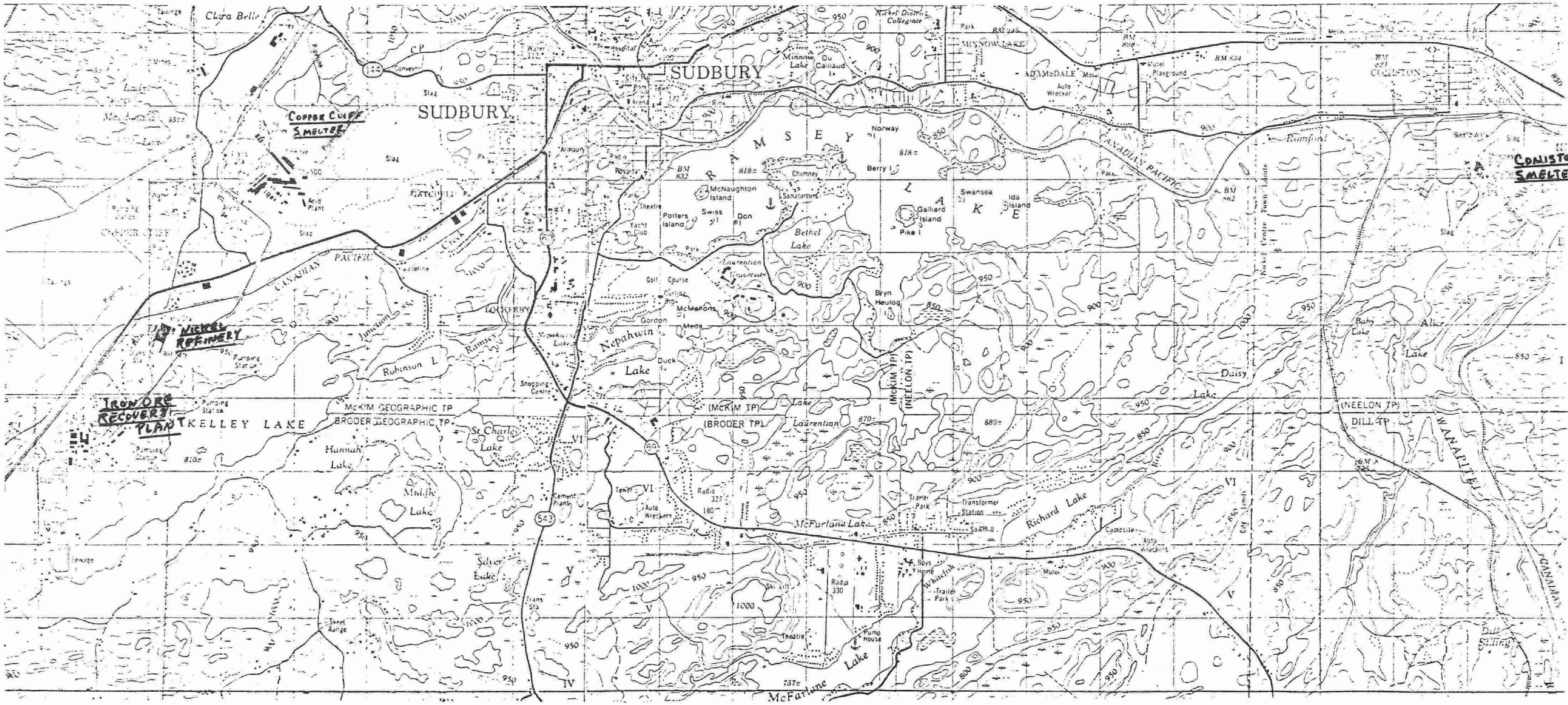
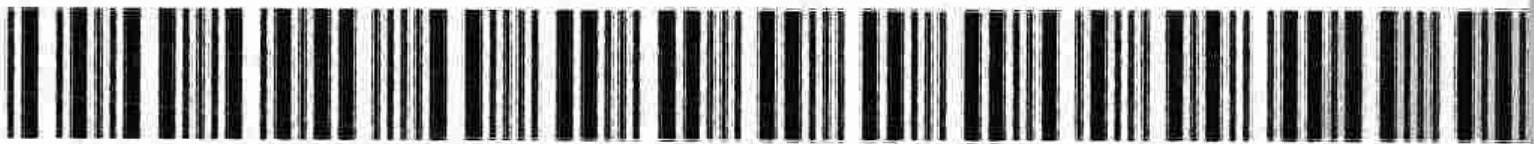


Figure 3
LEGEND:
Continuous SO_2 Monitor
Air Pollution Index Station
Hi-Vol. Air Sampler
Smelter
Chiniguchi
Lake Temagami
Grassy
Lake
Wanapitei
N
Skead
Hanmer
Morgan
Rayside
Falconbridge
Garson
Callum
SUDBURY
Ash St.
New Sudbury
Copper
Cliff
Coniston
Lockerby
Verner
St. Charles
Lake
Nipissing
Penage
Burwash
Scale: km
0 5 10



Clara Belle
SUDBURY
SUDBURY
COPPER CLIFF SMELTER
CONISTON SMELTER
NICKEL REFINERY
IRON ORE RECOVERY PLANT
KELLEY LAKE
RAMSEY LAKE
CANADIAN PACIFIC
Nickel District Collegiate
MINNOW LAKE
ADAMSDALE
CONISTON
Minnow Lake
Du Caillaud
Norway
Chimney
Berry I.
McNaughton Island
Sanatorium
Swansea
Ida Island
Galliard Island
Pike I.
Potters Island
Swiss
Don
Yacht Club
Theatre
Bethel Lake
Laurentian University
Golf Course
Bryn Heulog
McMenons
Gordon
Nepahwin Lake
Duck
Robinson L
Ramsey
Junction
LOCKERBY
Shopping Centre
McKIM GEOGRAPHIC TP
BRODER GEOGRAPHIC TP
(McKIM TP)
(BRODER TP)
(McKIM TP)
(NEELON TP)
(NEELON TP)
DILL TP
Laurentian Lake
St Charles Lake
Hannah Lake
Middle Lake
Silver Lake
Cement Plant
Radio
Auto Wreckers
McFarlane Lake
Trailer Park
Transformer Station
Sawmill
Richard Lake
Daisy Lake
Baby Lake
Alice Lake
Campsite
Boys Home
Whitefish
Radio 330
Ski Lift
Theatre
Pump House
McFarlane Lake
Skeet Range
Trans Sta
Rumford
Motel Playground
WANAPITEI
Dill Siding
Pumping Station
Acid Plant
Slag
Tailings
Conveyor
Hospital
Armoury
Park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